



Statistical post-processing of seasonal multi-model forecasts: Why is it so hard to beat the multi-model mean?

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Initialised climate forecasts on seasonal time scales, run several months or even years ahead, are now an integral part of the battery of products offered by climate services world-wide. The availability of seasonal climate forecasts from various modeling centres gives rise to multi-model ensemble forecasts. Post-processing such seasonal-to-decadal multi-model forecasts is challenging 1) because the cross-correlation structure between multiple models and observations can be complicated, 2) because the amount of training data to fit the post-processing parameters is very limited, and 3) because the forecast skill of numerical models tends to be low on seasonal time scales. In this talk I will review new statistical post-processing frameworks for multi-model ensembles. I will focus particularly on Bayesian hierarchical modelling approaches, which are flexible enough to capture commonly made assumptions about collective and model-specific biases of multi-model ensembles. Despite the advances in statistical methodology, it turns out to be very difficult to out-perform the simplest post-processing method, which just recalibrates the multi-model ensemble mean by linear regression. I will discuss reasons for this, which are closely linked to the specific characteristics of seasonal multi-model forecasts. I explore possible directions for improvements, for example using informative priors on the post-processing parameters, and jointly modelling forecasts and observations.